

The London Close Reasoner

LOGICAL STRUCTURE II

LOGICK is the Art of using REASON well in our Inquiries after Truth, and the communication of it to others. REASON is the Glory of human Nature, and one of the chief Eminencies whereby we are raised above our Fellow-Creatures in this lower World.

Isaac Watts (1674-1748)

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- 1 Advanced diagrams
- 2 Pros and cons
- 3 Two persons
- 4 Hypothetical reasoning
 - 4.1 Conditional proof
 - 4.2 Reductio ad absurdum
- 5 Explanations

1 Advanced diagrams

The diagram method of representing structure can be developed to handle more complex situations. We present some of these advanced techniques here, so that we can see the structure of arguments of these types. But we will not here be able to deal adequately with all the underlying logical issues.

2 Pros and cons

Our notion of of rgument is, in a sense, one-sided. We bring the various considerations favouring a conclusion together, and call that our argument; considerations pointing the other way are excluded from it. If need be, they are collected into a counter-argument. This is fair enough given the meaning of the word "argument"; there are the arguments for and the arguments against.

But in our thinking, and often in our presentations, we do not separate things

in that way. We deal instead with a complex structure in which the pros and cons, the argument and counter-argument, are combined, and balanced against each other. "Argument" is not the right name for such a structure; indeed, it seems to have no name, though it is a common enough thing. The words "case" (The case for A) and "position" (our position on B) come close, as does "rationale" (his rationale for C).

To adapt the diagram method of representing argument structure to the task of representing a case, position or rationale structure, we need only add a device to represent the con-consideration to match the arrow that we use for pro-considerations. For this we will simply use a flat-headed arrow. When a premise is joined to a conclusion with a flat-headed arrow it means that the premise is a consideration intended to count against the conclusion. Here is an example:

(1) Nita Renfrew, "Who Started the War?", 1987

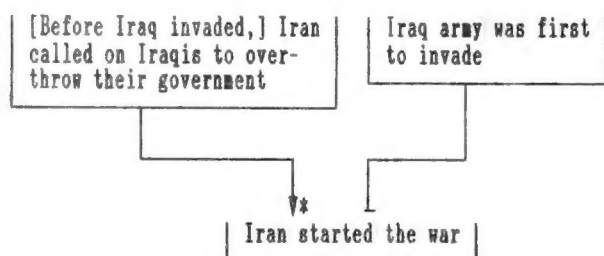
The truth, however, is that, although organized units of the Iraqi army were the first to cross the Iran-Iraq border on September 22, 1980, Iran started the war. It broke the peace when, soon after Khomeini's return, it began active steps to export his revolution to Iraq. Using the same methods successful in bringing down Shah Mohammed Riza Pahlevi, the ayatollah and his agents proceeded to call upon Iraqis to overthrow their government and to install in its place an Islamic revolution under his jurisprudence².

Here the author is arguing that Iran started the war in spite of the fact that

1. Isaac Watts, *Logick*, 1724, p. 1.

2. Nita M. Renfrew, "Who Started the War?" *Foreign Policy*, no. 66 (Spring, 1987), 98-108. p. 98.

Iraq invaded first, which fact, taken by itself, would count fairly heavily against that conclusion. We venture the following diagram:



The asterisk * is added to show which consideration the author regards as stronger. For someone who held that, since it was invaded by Iraq, Iran did not start the war in spite of the things it did before the invasion, we would put the asterisk on the other, flat-headed arrow.

In more complicated cases, more elaborate techniques will need to be devised to represent the relative weights of the various considerations.

3 Two persons

It is sometimes desirable to represent these pro and con structures as involving two persons, one on the pro side, the other on the con. Sometimes this is because we are dealing with a case, such as dialogue, when there really are two persons. But more often it is because a

(2) George Boole (1815 - 1864)

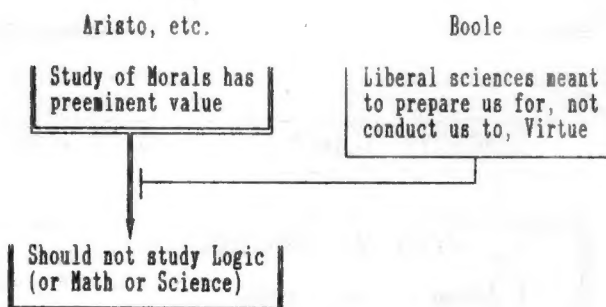
And indeed, many of the authorities which have been quoted against the study of Mathematics, are even more explicit in their condemnation of Logic. "Natural science", says the Chian Aristo³, "is above us, Logical science does not concern us." When such conclusions are founded (as they often are) upon a deep conviction of the preeminent value and importance of the study of Morals, we admit the premises, but must demur to the inference. For it has been well said by an ancient writer, that it is the "characteristic of the liberal sciences, not that they conduct us to Virtue, but that they prepare us for Virtue;"⁴ ...

single thinker is considering both sides, and is carrying on a dialogue with an im-

aginary opponent. This happens, for example, when an author anticipates an objection that might be made to his position, and then answers it.

Consider this passage in which Boole is defending the study of logic against the criticisms of such people as Aristo.

To diagram this and similar cases, we simply need a way of indicating which structure components belong to which persons. We will use double line boxes and arrows for the second person. The same principle could be extended to three or more persons, but we will not attempt that here.



(3) The Emperor and Sugiyama (1941)

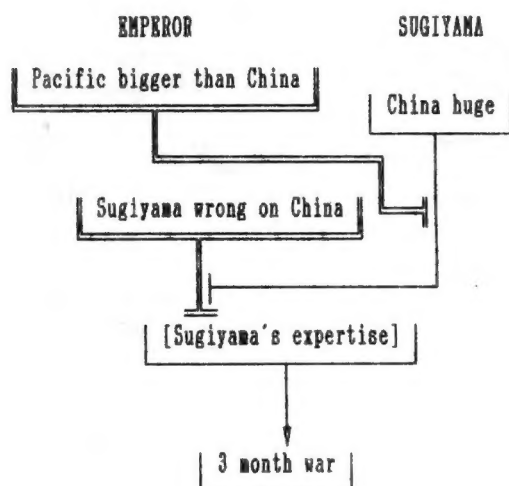
On 6 September 1941, at the supreme conference which decided on a declaration of war, the Emperor asked Army-Chief-of-Staff Sugiyama how long it would take the Army to conclude a victory in the event of a war with the U. S. A. Sugiyama replied that operations in the South Pacific could be concluded in three months. The Emperor retorted that when the Japan-China Incident had broken out in 1937 Sugiyama, then Minister of War, had said that the war would be ended in a month, but four years had gone by with no conclusion. Sugiyama protested that the interior of China was huge, to which the Emperor replied, "If the interior of China is huge, is not the Pacific Ocean even bigger? How can you be sure that the war will end in three months?"⁵

One way to look at this is to see Sugiyama as basing his "3 month" prediction on his expertise in military matters, and the Emperor as challenging that. (In spite of which, decisions were taken at this meeting that led to war.)

3. Ariston of Chios, a stoic philosopher (circa 250 B.C.) who held that ethics is the only thing worth studying.

4. *Mathematical Analysis of Reasoning*, 1847, p. 14. Boole will be known to students of computer science since boolean variables as used, say, in Pascal, are named after him.

5. Shunsuke Tsurumi, *An Intellectual History of Wartime Japan, 1931-1945*, 1986, p. 79.



4 Hypothetical reasoning

Sometimes we reason on a "what if" basis; we assume something "for the sake of argument", and reason from that. We make no claim about whether the thing we have assumed is true or false; indeed, we may know perfectly well that it is false, but that doesn't slow us down one bit.

Why should we want to do this? After all, if we start from an uncertain starting point our results will be equally uncertain. Isn't it like mooring your boat to a blade of grass?

It is certainly true that, however good our reasoning, we will not have shown anything to be true if it depends on our mere assumption. But that is not our purpose in this kind of reasoning. Instead, we make these assumptions because we want to see how ideas are connected to each other without committing ourselves to them.

When it comes to diagramming, we enclose hypothetical reasoning in a box, and label it HYPOTHETICAL. All of the reasoning goes in the box, not just individual components. That is to say, the assumption and everything that depends on it goes in the box. Other premises though, which we take to be actually true, can be combined with the assumption, and these will lie outside the box. We may think of the box as fencing off the hypothetical reasoning from reality.

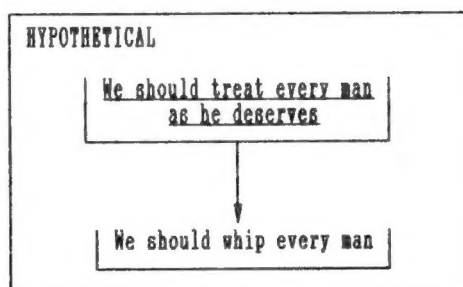
And, to be safe, we can underline the assumption that starts off the hypothetical reasoning, just so that we will remember what is going on, though this is not strictly necessary.

(4) Shakespeare, *Hamlet*, 1600?, II. ii.

Polonius: My lord, I will use them according to their desert.

Hamlet: God's bodikins, man, much better; use every man after his desert, and who shall 'scape whipping?

One way to look at this is to see Hamlet as engaged in hypothetical reasoning:



Hypothetical reasoning is an extremely powerful technique, though dangerous if you forget that the assumption on which it rests is no more than an assumption. Human nature being what it is, this danger is very real, which is why lawyers and politicians do not like to answer hypothetical questions.

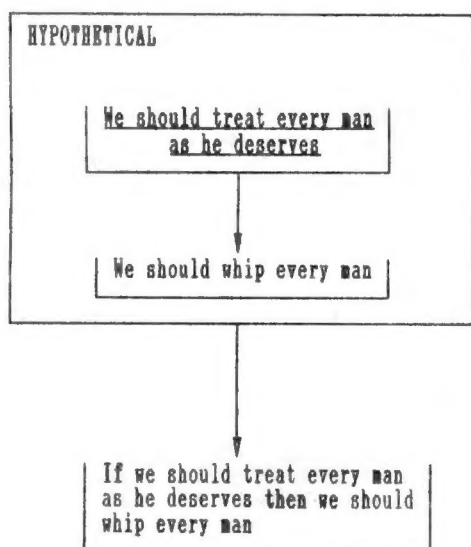
We will consider two uses to which hypothetical reasoning may be put: conditional proof and *reductio ad absurdum*.

4.1.1 Conditional proof

We get into hypothetical reasoning because we want to see how ideas are related. But once we find out, how do we report our discovery?

One way is with what logicians call a **conditional proposition**, that is, an "if... then..." statement. "IF what we assumed were true THEN what it led to would also be true." Hypothetical reasoning is a very good way of establishing the truth of conditional propositions, and doing so is called **conditional proof** by logicians.

We may interpret Hamlet as using this method, which we could represent like this:



It must be noticed that the conditional proposition that is the final upshot of this operation is NOT in the box; it is a truth about reality, as far as this argument goes, and does not depend in any way on the truth of the underlined assumption that starts off the boxed reasoning. The idea is that we **contemplate** the reasoning in the box without taking sides, and then, because of it, we **affirm** the conditional proposition.

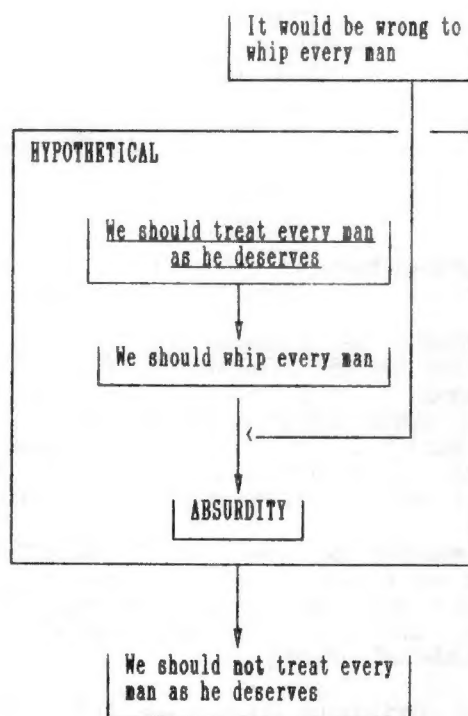
4.1.2 *Reductio ad absurdum*

This another use of hypothetical reasoning. If we can start with an assumption and reason our way to something that is absurd, self-contradictory, obviously false or otherwise ridiculous, then we know that that was a bad assumption, and so we can reject it and affirm its opposite.

When the absurdity takes the form of an out and out contradiction then the argument can be called a *reductio ad impossibile*. This appears to have been the first form of argument to have received systematic study. "It seems, then, that the first precise meaning of the word 'dialectics' was *reduction ad impossibile* in metaphysics."⁶ The reference is to some ancient Greek philosophers of the period just before Socrates, Plato and Aristotle, known as the Eleatic school, who would derive contradictions from such apparently innocuous assumptions as that there is more than one thing, or that some

things move. Some examples of their reasoning will be provided elsewhere.

Perhaps Hamlet is arguing in this way, relying on the obvious fact (outside the box) that it would be absurd to whip every man.



Notice how we allow an outside fact about reality (the wrongness of universal whipping) to come into the box to bring out the absurdity of what is going on in there. It is usually permissible in hypothetical reasoning to bring in outside facts about reality since our interest is usually to see how ideas relate to other ideas, including the ideas we have about reality. But sometimes we have other purposes, and this can get tricky.

It can also get tricky when in the course of doing hypothetical reasoning we want to use a second dose of hypothetical reasoning to carry out the process. We want a play within the play, a box within the box. This is OK, but you have to be careful. We will not go into such complications here, though we note that modern symbolic logic provides some very neat ways of keeping this kind of thing straight.

5 Explanation

Explanations are always a problem in argument analysis. They are not themselves arguments, but they involve arguments, and in several different ways, and it can be

6. William and Martha Kneale, *Development of Logic*, 1962, p. 9.

very confusing⁷. We will not attempt a complete account of explanation here, but will consider only those aspects that will help us in representing the structure of reasoning.

In the simplest kind of explanation, the author explains an effect by stating its cause. "The ground is wet this morning because it rained last night."

This is not an argument; the author is not trying to prove that the ground is wet. But there is a crucial *potential* argument in the background; we call it the *prediction* argument. If last night someone had known about the rain then that person could have predicted the wet ground in the morning. The reasoning by means of which this would be done is the prediction argument: "It is raining, therefore the ground will be wet in the morning". Or, more generally, "Here is the cause, so we may expect the effect."

It is not essential that the prediction argument actually take place in advance. "It rained on New Year's Eve in Calcutta in 1787, so the ground must have been wet on New Year's Day," is also a prediction argument, though it takes place centuries after the event.

Every explanation⁸ has a corresponding prediction argument, and we will use these arguments to stand for explanations in our diagrams⁹. But since the prediction argument is not actually being deployed in the explanation, we will put it in a box, as we do hypothetical reasoning.

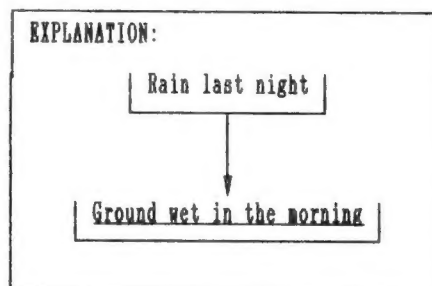
But we will label it as an explanation since it is not really hypothetical reasoning, and it would be disastrous to confuse these two things. The difference is this: In an explanation the components are all being asserted; only the argument arrow is not for real. In hypothetical reasoning it is the other way around; the components are not being asserted, only assumed, but the arguing is really being done.

7. See Whately's discussion of the word "reason" in *Historical Note 2*.

8. This holds at least for causal explanations, the kind now being considered.

9. The reverse doesn't hold. There are prediction arguments that are not associated with explanations. These occur, for example, when we predict simply on the basis of statistical averages. I can predict that a certain child born in 1987 will likely be dead before 2087 without in any way being able to state the cause of death.

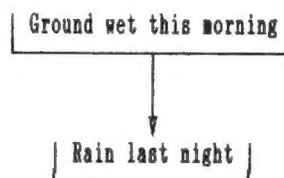
And we will underline the component that is being explained to help us remember what is going on. It is always the conclusion of the prediction argument.



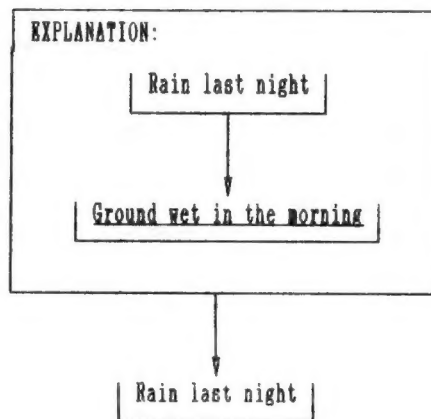
But though an explanation is not itself an argument, it is a package of assertions, and can be used in an argument like other packages of assertions.

One case of this is reasoning from effect to cause. "The ground is wet this morning, so it must have rained last night."

A simple representation of this argument would be:

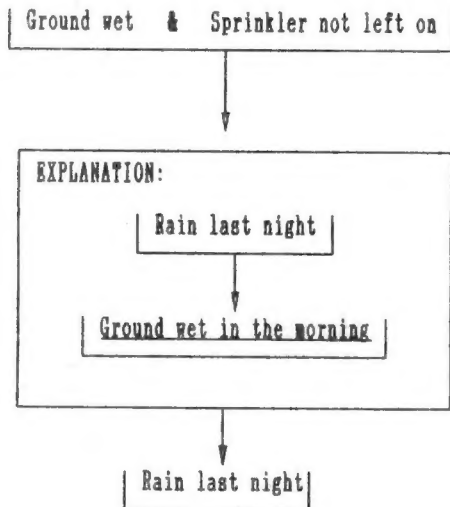


But a more detailed account would bring in the explanation aspect; "The ground is wet this morning. That fact is best explained by rain last night. Therefore, it rained last night."



That is reasoning from an explanation; we also reason to them. For example, one

might reason to the rain explanation after checking to see that the sprinkler was not left on over night. Then the complete reasoning to and from the explanation would be:

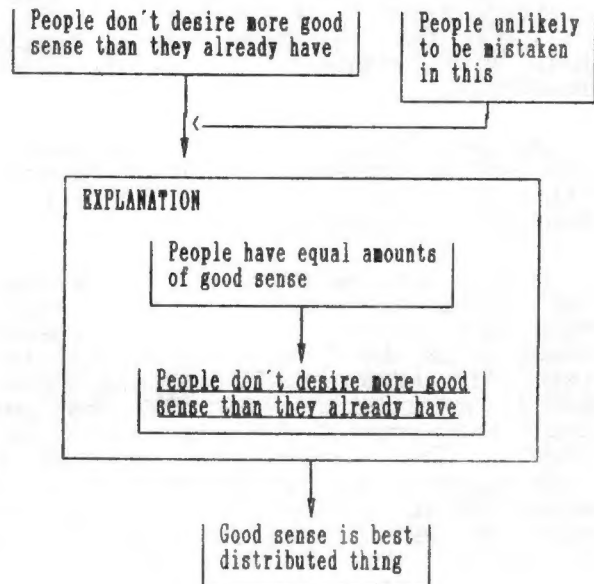


Here is another example, one which in its way is more realistic. This is the first step of a larger argument of Descartes' which runs along these lines: People are all born with the same reasoning ability, yet some people achieve more in reasoning than others. Why? Since it is not difference in ability, the reason must be that those who achieve more are employing a better method. And Descartes' own method, he will go on to say, is a guaranteed winner.

We prefer the methods of the *LCR* (which include some of Descartes' ideas), but be that as it may, here is Descartes' argument to and from an explanation:

(5) Descartes, (1596 - 1650), *Discourse on Method*

Good sense is the best distributed thing in the world: for everyone thinks himself so well endowed with it that even those who are the hardest to please in everything else do not usually desire more of it than they possess. In this it is unlikely that everyone is mistaken. It indicates rather that the power of judging well and of distinguishing the true from the false — which is what we properly call "good sense" or "reason" — is naturally equal in all men, ...¹⁰



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10. Descartes, *Philosophical Writings*, 1985, vol 1, p. 111. The *Discourse on Method* was first published in 1637.